DECEMBER 2

The President, SAMUEL G. DIXON, M.D in the Chair.

Seventeen persons present.

DECEMBER 9.

MR. ARTHUR ERWIN BROWN, Vice-President, in the Chair.

Seven persons present.

DECEMBER 16.

J. CHESTON MORRIS, M.D., in the Chair.

Eleven persons present.

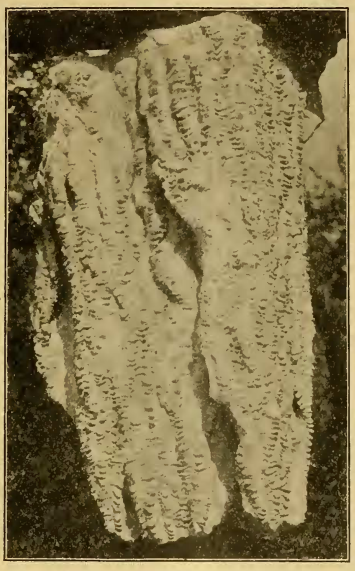
A paper entitled "Five New Species of Trachilomonas," by T. Chalkley Palmer, was presented for publication.

Minerals from Santiago Providence, Cuba.—MR. S. HARBERT HAMILTON exhibited some of the minerals met with during his recent explorations of portions of Cuba, and described the manner of their occurrence. He called attention to increments of raise shown by the southern coast of Cuba from Maysi to Santiago de Cuba (Puerto de Cuba). All along this coast are to be seen remains of from three to five terraces, and around the harbor of Santiago de Cuba are a series of amphitheatre-like benches, which, with the Sierra Maestre, give a very peculiar and picturesque effect to the landscape. These benches are fossiliferous, but the shells are usually only represented by casts.

This part of Cuba has unquestionably suffered an extensive subsidence, possibly about the beginning of Tertiary time. The peculiar shape of Santiago Bay is to be accounted for as an old valley, which the sinking of the land has allowed the sea to encroach upon. Since its submergence this portion of Cuba has gradually been raising; the raised beaches attesting to the incre-

ments of raise. It is believed that the floor of the bay is rising to-day, as it is only by constant dredging that it is possible for vessels of moderate draught to come to the dock, many of the larger steamers having to discharge their cargoes in the bay. It is said that formerly any vessel could dock without difficulty.

The coral rock of the seashore is being carved into huge sea caves, one of the most prominent being under the old Morro Castle at the entrance to the harbor. Further up the coast are two large



Stalactite showing cup method of growth.

caves, or rather, a series of caves, that are now above tide and a considerable distance inland. They are known as Cuevas de Caribiss, and are within a few miles of the bay of Aserradero, where lies the wreck of the "Viscaya," adjacent to a cocoanut grove, a few huts of fishermen and charcoal burners and the ruins of a diminutive Spanish fort. The caves were evidently originally carved out by sea action, just as the one under Morro is being formed to-day. They present another proof of the raise of this coast. They are now tenanted by millions of cave bats, *Artibeus*

parvipes Rehn, and *Brachyphylla nana*, whose guano was once exported, but is now untouched. It is stated that aboriginal remains have been found in them, but several days of excavation with five assistants yielded no return. It may be that further excavation would be more productive.

In these caves, in the Cuevas de Guano particularly, occur the most beautiful stalactites and stalagmites. They are not of the yellowish tinge so common in our limestone caverns, but of a snowy whiteness. When seen by the light of torches, wet, and covered with little shimmering crystals, they present a very beautiful appearance as they stand out from the black gloom of the cave. One huge growth, fancifully called the "Elephant's Head" by his companions, was successfully photographed by Capt. Jos. Priest. A stalagmite known as the "Grandificencia Casa Blanca" (the glorious white house) was removed with partial success and is now in the American Museum of Natural History. Their manner of growth was somewhat peculiar. Numerous little cups are formed from a quarter to a half-inch in size, arranged with the bowl upward, and lined with small crystals. As the water-carrying calcium bicarbonate slowly trickled from the roof, it was caught by the cups on the stalagmites and stalactites and gradually changed to the normal carbonate. This is an adaptation of inorganic economy he had not seen previously recorded. Several hundreds of pounds of these cave-growths were transported with danger and difficulty to Santiago and brought north.[1]

On an extension of the Ferro-Carril y Almacenes de Santiago that goes from Santiago de Cuba to Alto de Songo are the manganese mines of Ponupo owned by the Ponupo Mining and Transportation Company. The ore is a loose amorphous pyrolusite mined in open cuts and washed before shipping. The deposits seem to be enormous, but he had not explored much more than in the immediate vicinity of the works. The mineral is said never to have been found crystallized, but usually occurs in the amorphous condition in nodules, and sometimes in beautiful stalactitic masses called "Flor de Manganese. He was permitted to bring away the best examples of this interesting mineral, which had been conserved in the company's offices. Associated with the manganese are remains of a limestone formation containing oxide of manganese and a fossil which Mr. Vaughan has referred to the Eocene as *Obitoides forbesii*. It is possible that the manganese oxide may have been precipitated in

[1] Since the above was written it has been noticed that some of the stalactites brought back have gradually assumed a darker shade. This is doubtless to be accounted for by the oxidation of salts of the heavy metals, which while in the subterranean chambers had but a deficient supply of oxygen. $CaH_2(CO_3)_2 = CaCO_3 + H_2O + CO_2$. Being now removed from the cave atmosphere, oxidation of the trace of iron has occurred.

the Eocene ocean, where this foraminifer dwelt, just as the dredgings of the *Challenger* and other deep sea explorers have found it in the oceans of to-day. This resulted in the formation of a manganiferous Eocene limestone, which tropical conditions have largely removed as soluble bicarbonate of calcium, concentrating the binoxide of manganese as the present pyrolusite ore deposit.

In 1524 the copper mines of the Sierra Cobre were opened. As high as fifty tons of ore a day have been mined from them, and the shafts are said to extend vertically for twelve hundred feet. The breaking out of the "Ten Years' War" put an end to the working. From 1867 to 1901 nothing was done. The workings are said to be the largest in the world. This is to-day indicated only by the hundreds of tons of ruined machinery, huge buildings and dumps with innumerable abandoned shafts and tunnels. Owing to the dilapidated and extensive nature of the Cobre deposits, a detailed study of them was impossible. The principal copperiferous veins seem to perpendicularly cut, a shale whose dip is 70°, strike S. 20° W. Of course many offshoots occur, adding to the complexity. The ore at present mined and shipped seems to be an intimate mixture of oxide, carbonate and silicate of copper. Sulphides exist further down as they were found in the old dumps. Azurite and chalcopyrite were found in place. Oxide of iron, pyrite, crystals of quartz of peculiar habit, oxide of copper and other minerals forming a gossan, are met with, but not in good specimens. The water now filling the mines is highly charged with chalcanthite and melanterite, rude plants are in operation removing the copper from solution. Chalcanthite and brochantite are often found deposited in unexposed places.

A mile or so upstream from the village, on the Rio Cobre, there is an interesting mineral occurrence. Here a pyritiferous dike or vein cuts a calcareous rock. The pyrite is oxidized to sulphate of iron and the iron precipitated as hydroxide by vegetable matter, producing in the reaction sulphuric acid. This in acting on the calcium compounds has produced gypsum. The gypsum thus formed is not crystallized in the usual shapes, but by a multiple growth along certain axis, produces unusual forms and combinations. In many instances the crystalline masses are of limpid pureness, free from inclusions. Again the molecules in their arrangement seem to include as much foreign matter as possible.

In the valley of the San Juan, near the hill famous in history, which is a coarse conglomerate gravel, are deposits of clay which yield a rather inferior brick. Here are also deposits of sand and gravel extending to a considerable depth, as the experimental wells put down by Mr. LaBelle preliminary to operations on the new Santiago waterworks indicated. This sand and gravel is mostly too coarse for building. The valley of the San Juan was evidently

much deeper and has been filled since this portion of the island sunk. The same phenomenon is illustrated on the Santa Ynase road north of the town.

At Dos Bocas a dark-gray rock has been quarried for road metal. It is probably a fine-grained trap. Dip? 30° to S.W.

The strata exposed in the magnificent gorge of the Rio Guaninicum near Santa Ana is in some places suitable for building. The new schoolhouse at Santiago and the piers of the Cuba companies railroad bridge are of this stone. Dip 20° S.E. There appears, however, to be a dearth of good building material in this district.

Some local mining men in Santiago de Cuba, who had visited the summit of the Gran Piedra, 3,700′ A.T., suggested that it showed signs of former local glaciers. In company with Captains Erwin and Priest the ascent was made with some hardship, owing to inclement weather. The summit is composed of two huge granite-like masses worn very smooth, suggesting possible ice action, but there were no scratches to be seen or anything to indicate moranic material. The evidence obtained was purely negative, but owing to the incessant rain and rank plant-growth chances for observation were limited.

An attempt to ascend the Pico Tarquino failed. A height of 5,875 ′ A.T. was attained, but owing to the severe meteorological conditions, lack of suitable companions and supplies, at the end of several days it was necessary, on account of the illness of his companions, to abandon collections and return as best they could. The mountain, consisting of three peaks apparently, are heavily wooded. The speaker was only able to observe that tree ferns do not occur below about 1,000′ A.T., and that considerably above this altitude two species of snail, *Helicina pulchra* and *Pleurodonte bayamensis*, occur, which are not found at lower levels.

Mt. Magota, 850′ A.T., was also ascended. The start was made from Santa Ana through an interesting primeval forest. The mountain is capped by a limestone mesa about 350′ thick. The top is only to be attained by a narrow cleft which would not have been found but for the assistance of the Cuban guide. The limestone top has been carved by the elements into holes and pinnacles of exceeding sharpness so as to make passage of its summit dangerous and difficult. This annoying structure of rock is known as "dent de Perro" (teeth of the dog), and is certainly well named.

In this rock are caves where General Maceo dwelt under Spanish régime. Surrounded by sisal and other thorny plants this place must have been impregnable. The caves are now given over to bats and an occasional brigand. Fine examples of *Pleuradonte marginella rostrata* Pfr. and *Zachrysia proboscidea* Pfr. were here obtained, but the mountain is overrun with a species of iguana which feeds on the snails.

Near Magota mountain is a good indication of copper which has

never been touched. The new railroad will make it available. In connection with copper and the supposed indication which the presence of certain plants are said to give of the existence of metals, it may be mentioned that only here and at Cobre had he met with the cycad *Zamia* It may only be a coincidence.

While in Cobre he received specimens of chromite said to have come from the neighborhood of Holguine. The deposit was not seen.

The speaker said in conclusion that he desired to return thanks for the courtesies he had received from the many Americans and natives he had met while collecting and studying on the island.

DECEMBER 23.

Mr. ARTHUR ERWIN BROWN, Vice-President, in the Chair.

Ten persons present.

A paper entitled "On the Terrestrial Vertebrates of Portions of Southern New Mexico and Western Texas," by Witmer Stone and James A. G. Rehn, was presented for publication.

DECEMBER 30.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Thirty-six persons present.

The following were ordered to be printed: